M. Koratzinos – selected topics

TE-MPE-PE section meeting,

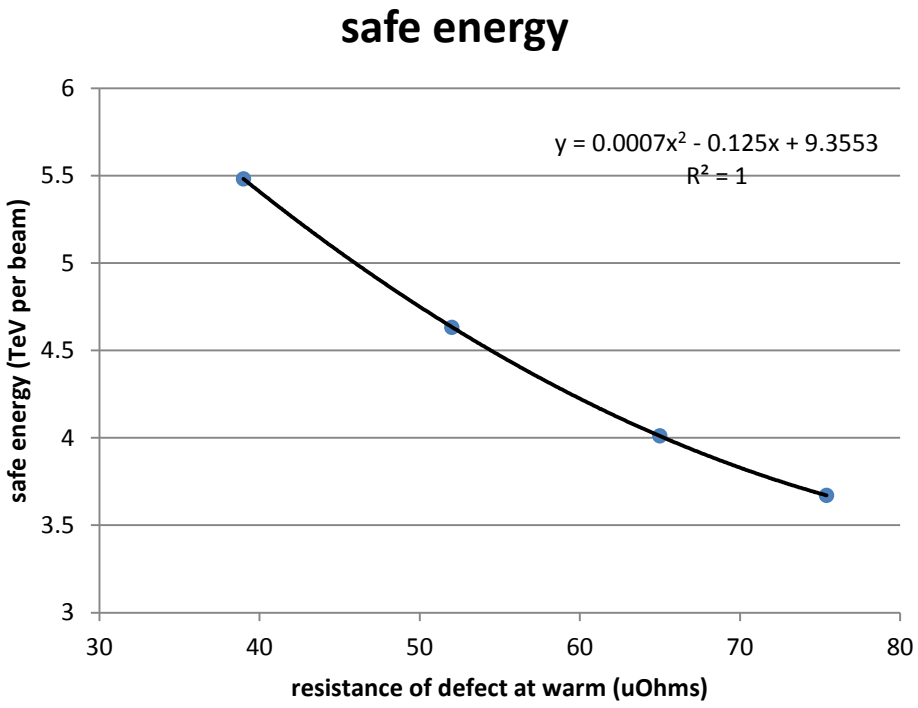
7/11/11

Recent work

- My main work revolves around the safe energy for the LHC.
  - Thermal Amplifier (CSCM)
  - Simulation of safe energy vs defect
  - Quench propagation
  - Diode busbar contact resistances
- This is work in progress and I will show a couple of slides on questions relevant to the section

Results of simulation of safe energy

- New simulation using the latest, best known values for RRR, lengths, etc.



For RB Magnet quenches (propagation through the bus bar) and EE time constant of 68sec

Energy	R_defect_max
3.5TeV	-
4TeV	66uOhms
4.5TeV	54uOhms
5TeV	45uOhms
5.5TeV	39uOhms

There is very little difference for prompt quenches

How much did the numbers change since Chamonix 2011?

Energy	R_defect_max	R_def_max Chamonix 2011
3.5TeV	-	
4TeV	66uOhms	55uOhms
4.5TeV	54uOhms	46uOhms
5TeV	45uOhms	44uOhms?

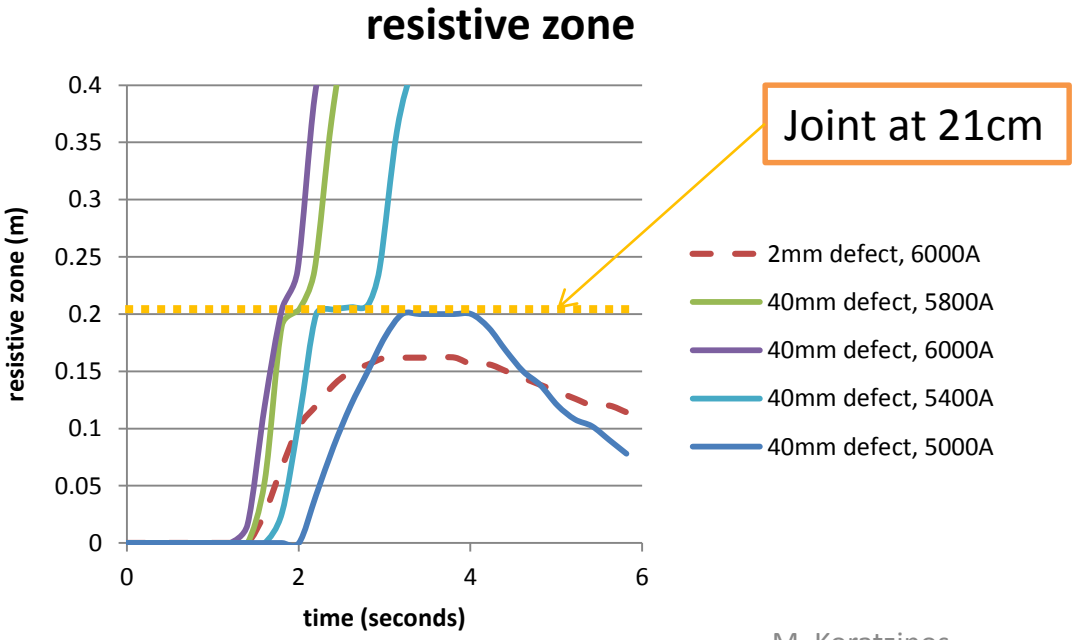
All numbers are for busbar propagation quenches and for 68sec energy extraction

In Chamonix 2011 the distance of the interconnect to the diode was smaller than in reality. Many other small change. Also, for 5TeV the calculation (44uOhms) was done for RRR=100 and not 200 as for the newer calculations

There is a difference for 4TeV and 4.5TeV that needs to be understood

Correlation between propagation and defect

- A bad defect acts as a thermal barrier (as well as an electrical one)
- We need to answer the question as to if we get quench propagation from a diode to a bad joint.
- All tests in 56 were done on near-perfect joints
- Simulation shows that in a bad joint, quench propagates quickly.



When no propagation is seen to a good joint, there is propagation to a bad joint, even at current levels 1000A less

We cannot assume that there is no quench propagation, even at 3.5TeV

Do we need to test the RQ circuits?

- No RQ simulation has been performed recently.
- The expectation is that the quench does not propagate through the busbar, since the length that the resistive zone needs to travel is much larger than in the case of the RB (3.6m from the heat sink bolted connection for the RQ compared to 60cm in the case of the RB)
- **If** the above is accurate, for the RQ circuits, only prompt quenches are relevant
- Simulations will be performed before the external review

It is important that we perform these simulations. This is not as simple as it sounds, as Arjan has to spend quite a few days ‘tuning’ his model for the RQ circuit

end